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ABSTRACT

Cooperative classroom structures create more positive student attitudes and interpersonal relations. Their effect on student learning is less clear. TGT (Teams-Games-Tournament) is one cooperative-competitive classroom structure which facilitates learning mathematics and language arts. A study applying TGT to third grade reading classes is reported. TGT students learned more vocabulary and verbal analogy skills than did a comparable control group. The study shows clearly that both cognitive and affective outcomes can be improved by changing the level of classroom cooperation-competition. (Author/MPJ)

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Student Teams Can Improve Basic Skills: TGT Applied to Reading[1]

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Abstract

Cooperative classroom structures create more positive student attitudes and interpersonal relations. Their effect on student learning is less clear. TGT (Teams-Games-Tournament) is one cooperative-competitive classroom structure which facilitates learning mathematics and language arts. A study applying TGT to third grade reading classes is reported. TGT students learned more vocabulary and verbal analogy skills than did a comparable control group. The study shows clearly that both cognitive and affective outcomes can be improved by changing the level of classroom cooperation-competition.

Introduction

The use of student teams in classrooms has recently received considerable attention (cf. Johnson & Johnson, 1974, for review). There is evidence that introducing student teams will (1) create more positive interpersonal relations among students, and (2) make the students more positive toward their classwork. Students do not appear to learn more when a teacher switches to cooperative student teams.

What is clear is that for educational innovations to be accepted by the educational community they should improve cognitive skills. One particular student team approach which has improved student learning is TGT (Teams-Games-Tournament). A sizable body of research has been generated evaluating TGT's effects on student learning, attitudes, and interpersonal processes. As noted by DeVries (1976), TGT has consistently created improved achievement in mathematics and language arts.

The present study extends earlier TGT research by asking whether TGT can improve student reading skills. Both basic vocabulary skills and more complex reading comprehension skills are addressed. If TGT can also improve reading skills, skills that range dramatically in cognitive complexity, this will provide strong support for viewing TGT as a generic learning structure, one which can be applied across subject areas.

TGT: A review. TGT represents a comprehensive change in both classroom reward and task structures. The change in reward structure involves reinforcing students in small groups, as well as the individual student level. Task structure is changed by having students perform in small groups, rather than in an isolated, individual setting.

TGT has three structural components: teams, games, and tournaments. The team component involves assigning students in a classroom to a series of four- or five-member teams. The students are assigned to create maximal heterogeneity within each team (on student achievement, race, and sex) and equality across teams. Team membership remains intact over time; within-team interaction and cohesion are fostered by frequently held teamwork sessions and by assigning teammates to adjacent seats.

The games component consists of a series of instructional (or learning) games which require skills addressed by the curriculum unit. The games consist of a series of multiple-choice, true-false or objective-type items with a clear, correct answer to every item.

The tournament component consists of weekly (or even twice-weekly) game-playing sessions, typically lasting 30 to 50 minutes, in which each student competes with two other comparable students representing other teams. At the end of each tournament

a "top scorer," "middle scorer," and "low scorer" are declared for each three-person tournament table. The individual student scores are converted to team scores, the team scores are ranked, and winning teams are declared. Public feedback concerning both individual and team performance is provided periodically by classroom newsletters.

TGT: Explaining its effects. TGT effects are due in part to a changing of two cognitive mediating variables in the individual student (DeVries & Edwards, 1974). That is, students in TGT classes believe (1) they have a reasonable chance of succeeding in the class, and (2) that success in the class is important to them. Both of these cognitive mediating variables (perceived probability of success and importance of success) have been posited as integral parts of the learning process (Kagan, 1974; McKeatchie, 1974). The specific mechanisms by which TGT affects these cognitive variables have been detailed by DeVries and Edwards (1974).

Research questions. The main question for the present study is whether TGT, when compared to a more traditional classroom management structure, results in greater acquisition of two diverse reading skills (reading vocabulary and verbal analogies) for third grade students. Another question, of secondary interest, is whether TGT facilitates acquisition of reading skills for some students more than others. Edwards, et al. (1972), report greater

TGT effects in mathematics classes for low-ability classes than for average-ability classes. The present study will test for a possible trait-by-treatment interaction effect. Additionally, because two reading skills are addressed, one involving more complex cognitive processes than the other, it is important to assess whether TGT is equally effective for both types of skills.

Method

Subjects

The students were 53 third grade students in an elementary school in the Syracuse, New York area. Fifty-one percent were females. The Gates-MacGinitie Reading Test, Primary C, Form 2 (given during month two of the third grade academic year), was used to measure verbal ability. The average grade equivalent score for the Vocabulary section was 4.2 (range from 1.5 to 7.1) and for Comprehension was 4.2 (range from 1.4 to 7.0).

Procedure

The study was conducted for a five-week period, and used a simple two-group comparison, contrasting TGT with a control treatment. The first three weeks focused on vocabulary skills, the latter two weeks on verbal analogies. Each treatment group comprised a separate reading class, with both groups meeting during the same time period of the day. The students had all been involved in a six-week TGT language arts study (cf. DeVries, et al., 1975). A two-week vacation separated the two experiments.

For the language arts experiment, the students had been randomly assigned (stratifying on verbal ability) to the two treatment conditions. The students remained in the same treatment groups for the present study. As is reported subsequently, the two treatment groups entered the reading experiment with roughly comparable skill levels.

Each treatment group met daily for a 50-minute period. Two teachers were involved in the experiment, with teacher effect partially controlled by rotation of teachers across treatment groups every five to seven school days, resulting in equal exposure of both groups to both teachers. Pre- and post-measures were obtained on all but one dependent variable.

Independent Variable

The independent variable of interest is the classroom managerial structure (comprised of both task and reward dimensions). Other dimensions on which the treatment conditions might vary were held constant. The treatment groups received equal exposure (in amount of time) to both sets of reading objectives (vocabulary and verbal analogies). Both treatments were taught vocabulary skills using the Ginn 360 series (levels 7, 8, and 9), with Reading-Thinking Skills (published by Continental) being the source for verbal analogies.

In order to partially control for a "Hawthorne effect" the control students were given unusual classroom activities. These

included informal games, use of multicolored worksheets, and individualized attention given to low-reading students. Six low-reading control students and seven low-reading TGT students were regularly given additional instruction designed to preteach vocabulary (focusing both on decoding and definitions).

Teams-Games-Tournament treatment: The TGT treatment took a form similar to that used in earlier TGT studies (cf. DeVries & Mescon, 1975). The team component involved assigning each student to a four- or five-member team. The six teams formed were divided into two three-team leagues, entitled the "American League" and the "National League."

The teams competed on thirteen vocabulary games and nine verbal analogy games. Each game contained between 32 and 39 items. The thirteen vocabulary games (containing 465 vocabulary items) varied primarily in word difficulty, roughly following the three levels (7, 8, and 9) of the Ginn 360 series. A typical vocabulary game item is listed:

A person who cuts hair.

(a) barber

(b) singer

(c) banker

A student at each game table would read aloud the definition and the three alternative answers. The student would then say which alternative word correctly matched the definition. The student's

opponents were asked to either agree with or challenge the answer, followed by the checking of the answer on an answer key.

The nine verbal analogy games (309 total items) focused on six types of analogies: part-whole, antonyms, synonyms, size, degree, and functional relationships. An example is:

Sleepy goes with tired as confused goes with:

(a) afraid

(b) mad

(c) bewildered

Playing the verbal analogy games followed the same procedure described above for the vocabulary games. A practice worksheet was designed for each game, and the students worked on these worksheets (during team practice sessions) prior to playing the game.

TGT tournaments were conducted twice weekly, for approximately 30-40 minutes each. Classroom newsletters describing the performance of both the student teams as well as individual students were distributed weekly.

Control: The control condition focused on the same curriculum objectives as did TGT, but used a different reward and task structure. In the Control class, students were always asked to work by themselves; grades and teacher praise were administered to individual students. All vocabulary and verbal analogy items taught to the TGT students were also taught to the Control students

using the practice worksheets and other exercises. Informal learning games were included in the Control condition (in order to partially deal with a possible "Hawthorne effect"); however, no formal contingencies were assigned by the teacher to game performance in Control.

Dependent Variables

Multiple measures of both reading vocabulary skills and verbal analogy skills were given.

Vocabulary skills: Two tests of vocabulary skills were administered, both on a pre- and post-test basis. The first measure was a Treatment-Specific Vocabulary Test, comprised of sixty items selected on a stratified-random basis from the 465 vocabulary items taught. Each item was listed in the same format as that used in the practice worksheet. The coefficient alpha measure of internal consistency is .94.

The second vocabulary skills measure was the Gates-MacGinitie Reading Test-Vocabulary, Primary C. Form 2 was administered as the pre-test and Form 1 as the post-test. The pre-test was administered approximately three months before the beginning of the experimental period, as a part of the school's annual achievement testing. The 52 items for Form 1 included the thirteen vocabulary games.

Verbal analogy skills: Two measures of verbal analogy skills were also administered. A thirty-item Treatment-Specific Verbal Analogies Test was given (both a pre- and post-test) to all students. The test consisted of a stratified-random (stratifying on type of analogy and difficulty level) sample of the verbal analogy items used in the games (coefficient alpha = .76).

A second test was designed as a measure of a possible transfer of the experimental effect. It was possible that students were memorizing the verbal analogy items, and not developing the general skill of detecting the logical relationships present in the analogies. Consequently, the authors designed a second 24-item Verbal Analogies Test which sampled the six types of verbal analogies taught. The students had been exposed to none of the items during the experimental period. The test was administered as a post-test only. The coefficient alpha was .88.

Data Analysis

The general linear model approach to the analysis of covariance (Cohen, 1968) was the analytical procedure used to test for experimental effects. The particular linear model used involved the step-down analysis defined as Method 3 by Overall & Spiegel (1969).

Results

Treatment group comparability. Because both treatment groups had received prior exposure to an experimental treatment in language arts, the comparability of the two groups (at day 1) in reading skills was assessed. Table 1 reveals no significant difference in pre-test means and standard deviations between TGT and Control for any of three measures.

INSERT TABLES 1 AND 2 ABOUT HERE

Vocabulary skills. The results of the general linear analysis for the Treatment-Specific Vocabulary Test are listed in Table 2, with treatment group means and standard deviations detailed in Table 1. Table 2 summarizes the results for each dependent variable. Three terms were entered into the model for every variable in the following order: the pre-test score for the dependent variable, the Treatment (TGT coded as 1; Control coded as 0), and the pre-test by Treatment interaction. The Incremental R^2 term indicates the amount of additional variance in the dependent variable explained by the addition of the term to the model.

INSERT FIGURES 1 AND 2 ABOUT HERE

Significant Treatment [$F(1,50) = 15.39$, $p < .01$, $R^2_I = .15$]

and Ability-by-Treatment interaction [$F(1,49) = 5.37$, $p < .05$, $R_I^2 = .05$] effects were obtained for the Treatment Specific Vocabulary Test (Table 2). The treatment main effect is explored in greater detail in Table 1. As indicated, the TGT students gained more than did Control. Figure 1, which contains the within-cell regression slopes for the two treatment conditions, suggests the positive TGT effect was accounted for primarily by the lower achieving students.

Significant Treatment [$F(1,48) = 7.69$, $p < .01$, $R_I^2 = .08$] and A x B Interaction [$F(1,47) = 6.39$, $p < .05$, $R_I^2 = .06$] effects were also detected for the Gates-MacGinitie (Table 2). Table 1 indicates the treatment effect was due to greater growth in vocabulary skills by the TGT students. Figure 2 provides a closer look at the significant interaction effect, indicating that the initially lower achieving TGT students were the most positively affected by the treatment.

Verbal analogy skills. A significant Treatment effect [$F(1,50) = 12.26$, $p < .01$, $R_I^2 = .14$] was obtained for the Treatment Specific Verbal Analogies Test (Table 2). The effect was due to greater growth in verbal analogy skills by the TGT students than by those in Control (Table 1). The test of any possible transfer effects (Verbal Analogies Test) required the use of the pre-test Treatment Specific Verbal Analogies Test score for

the A term. The results indicate no significant treatment or interaction effects. However, the treatment group means in Table 1 show the TGT group to have scored higher than did Control.

Summary. The results indicate a positive and strong (in variance explained) TGT effect on vocabulary skills, with the effect due primarily to gains by initially low achieving students. For verbal analogies, a positive and strong TGT effect was noted for the treatment specific measure. Only a slightly positive trend was detected for the test measuring transfer.

Discussion

The positive TGT effects on reading skills noted in this study correspond to earlier findings which support the use of TGT in the classroom (cf. Edwards, et al., 1972; DeVries & Mescon, 1975; DeVries, et al., 1975; DeVries, 1976). This study extends the TGT research to a new skill area--reading--and suggests the technique may have relevance for teaching both basic vocabulary skills as well as more complex comprehension skills such as understanding of verbal analogies. What follows is a more detailed interpretation of the findings and explorations of implications for the practice of teaching.

TGT effects on vocabulary skills. It is important in interpreting the results to estimate the power of the TGT effect. As table 2 indicates, TGT accounted for 15% of the variance for the Treatment Specific measure, and 8% of the variance for the

Gates-MacGinitie measure. A "mastery learning" approach to the data also estimates the strength of the TGT effect. Such an approach sets an arbitrary, absolute criterion (for example, 90% of items correctly answered) for defining whether students acquired the targeted skill areas. Using the 90% criterion, the results for the Treatment Specific Vocabulary Test can be summarized as follows: For the TGT students, 7% evidenced mastery at pre-test, whereas 70% had mastered the skill area at post-test (a gain of 63%). In contrast, 15% of the Control students had mastered the test at pre-test, and 64% at post-test (a gain of 39%). The results indicate that TGT had a dramatic impact on the vocabulary level of these third grade students in the brief period of three weeks.

The ability by treatment interaction effects noted for both measures of vocabulary skills support earlier TGT research (Edwards, et al., 1972) in which low ability TGT classes evidenced more academic growth than did average ability classes. The current results should be interpreted cautiously, however, because of a possible "ceiling effect." Table 1 indicates a post-test TGT mean of 55.04 for the treatment specific measure (a 60-item test) and a mean of 46.93 on the Gates-MacGinitie measure (a 52-item test). Because of this concentration of post-test scores at the upper end of the test scale, both tests may have been insensitive measures of growth for high achieving students.

TGT effects on verbal analogy skills. The power of the TGT effect for the Treatment Specific Verbal Analogies Test is also impressive (14% of the variance). Using the 90% criterion, 0% of the TGT students evidenced mastery at pre-test, whereas 78% reached mastery at post-test. For Control, the contrast is from 0% (pre-test) to 58% (post-test). As these percentages show, verbal analogies represented a totally new skill for all students. Also, the percentages indicate both treatment groups were effective (particularly given the two-weeks' instructional period) in teaching a complex and totally new skill area.

The lack of a significant TGT effect for the verbal analogies test measuring a possible transfer effect may be due in part to the test being too easy. The test consisted of 24 items: the TGT mean was 20.30, and the Control 19.65. Using the 90% criterion, 52% of the TGT students and 38% of the Control students reached mastery. The results indicate considerable transfer of learning with scores from both treatment groups concentrating at the top end of the distribution. More than just memorization of specific examples of verbal analogies occurred in students from both treatment conditions.

TGT - What's next? The present study extends the use of TGT into an important new skill area. The positive impact of TGT on both vocabulary and verbal analogies skills suggests it

can be used constructively in teaching reading. The present study does need to be replicated. Only by such replication can the power and limitations of TGT be fully understood. The authors encourage both researchers and teachers to conduct systematic evaluations of TGT in ongoing classrooms.

The effects of TGT on reading must be seen in the context of the other seven TGT studies already in press (DeVries, 1976). TGT has repeatedly increased achievement in mathematics and language arts. The current study is just one further extension of the empirical testing of TGT. While cross-validation of TGT should continue, the evidence collected gives a uniquely strong base for claims of the overall effectiveness of TGT. The model of conducting a wide range of field experiments on a classroom intervention provides a rich knowledge base, and should be given serious attention by educational researchers.

As Johnson and Johnson (1974) have stated, cooperative structures are important classroom alternatives because of their rather consistent effects on classroom process and student attitudes. The current study focused only on academic achievement. Other TGT studies have measured classroom process and report strong and consistent effects. For example, TGT has created improved race relations among students in four studies in which race relations were assessed (DeVries, et al., 1975). When

assessing the efficacy of cooperative classroom structures, their impact on nonacademic outcomes should be weighted heavily. TGT is one intervention which creates positive effects in both interpersonal relations and achievement. Further research should be conducted on other cooperative reward structures which maximize both outcomes (interpersonal process and learning).

So often classroom research proceeds down dead-end streets. So often research takes the form of one researcher exploring a research topic through two or three experiments resulting at most in several journal articles. TGT fortunately has moved beyond basic research into a classroom technique used nationwide and beginning in 1977, internationally. TGT is published commercially (Argus Communications, Niles, Illinois) with many of the instructional materials used in the research phase (e.g., verbal games) included in the produce line. Under development for 1977 are 400 mathematics and language arts games which represent an integrated TGT curriculum. The authors hope that the greater use of TGT in classrooms will be accompanied by continuing careful evaluation of its effects in new classroom settings. Such a combination of careful application and evaluation will insure a major impact of TGT on the education community.

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Table 1

Treatment Group Means and Standard Deviations for Reading Skills Tests

		TGT		CONTROL	
		Pre	Post	Pre	Post
Treatment Specific Vocabulary Test (60 Items)	$\bar{x}$	35.04	55.04	40.77	52.15
	S.D.	13.72	5.20	11.76	6.44
		(27)	(27)	(26)	(26)
Gates-MacGinitie Vocabulary Test (52 Items)	$\bar{x}$	35.78	46.93	37.44	44.63
	S.D.	9.28	4.37	9.43	6.61
		(27)	(27)	(24)	(24)
Treatment Specific Verbal Analogies Test (30 Items)	$\bar{x}$	15.41	27.82	16.96	25.96
	S.D.	4.81	2.47	5.01	3.85
		(27)	(27)	(26)	(26)
Verbal Analogies Test (24 Items)	$\bar{x}$		20.30		19.65
	S.D.		3.09		4.10
			(27)		(25)

Note: ( ) = n

Table 2

Results of General Linear Analyses for
Treatment-Specific Tests and Gates MacGinitie Tests

DEPENDENT VARIABLE	SOURCE OF VARIANCE	DF	Incremental R^2	F Ratio[1]
Treatment Specific Vocabulary Test (n = 53)	Ability (A)	1,51	.36	28.86**
	Treatment (B)	1,50	.15	15.39**
	A X B	1,49	.05	5.37*
	Total		.56	
Gates-MacGinitie Vocabulary Test (n = 51)	Ability (A)	1,49	.43	37.12**
	Treatment (B)	1,48	.08	7.69**
	A X B	1,47	.06	6.39*
	Total		.57	
Treatment-Specific Verbal Analogies Test (n = 53)	Ability (A)	1,51	.29	21.32**
	Treatment (B)	1,50	.14	12.26**
	A X B	1,49	.02	1.74
	Total		.45	
Verbal Analogies Test (n = 53)	Ability (A)	1,51	.29	21.11**
	Treatment (B)	1,50	.03	2.36
	A X B	1,49	.00	1
	Total		.32	

*P < .05

**P < .01

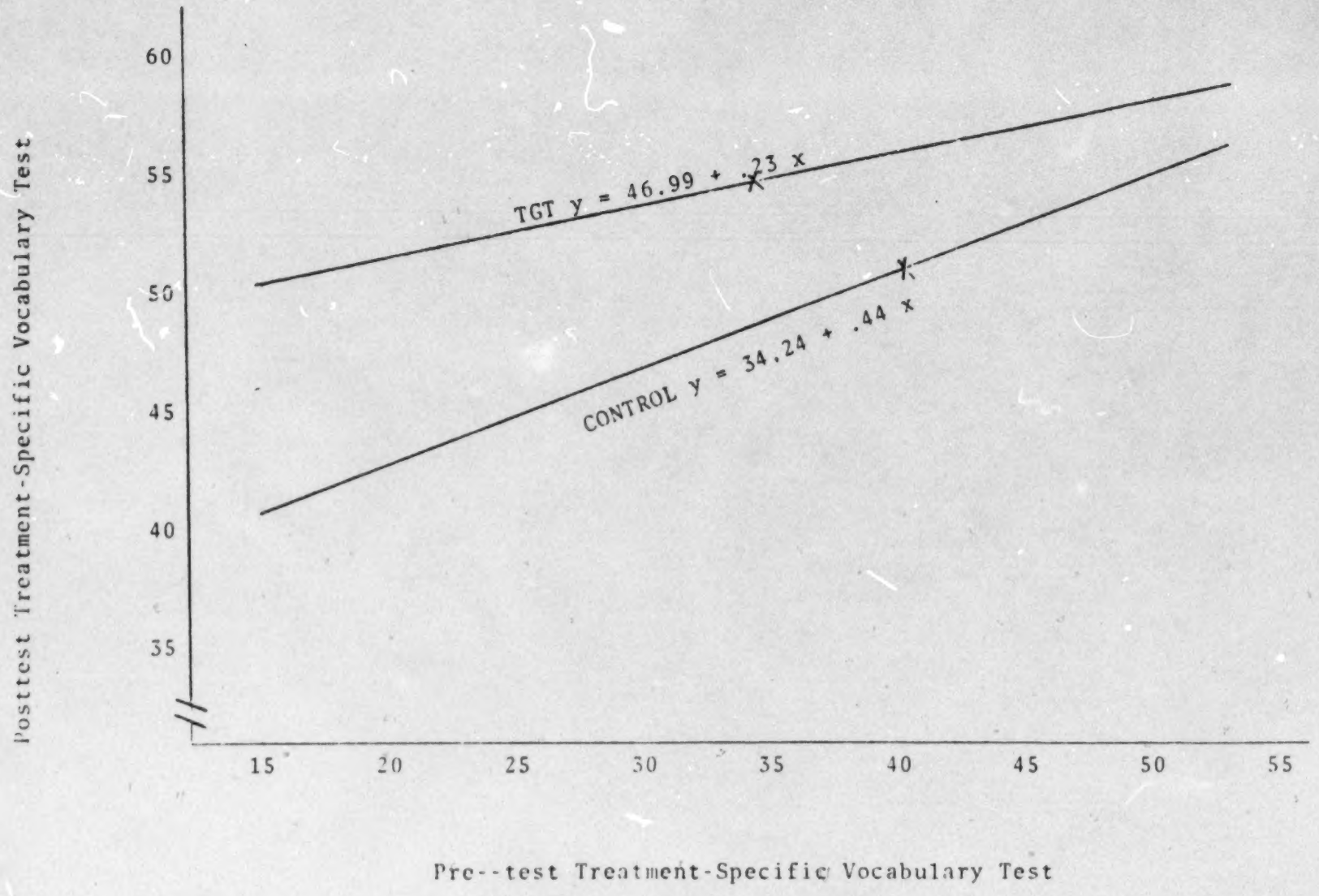

Figure 1. Within-Cell Regression Slopes for Treatment-Specific Vocabulary Test

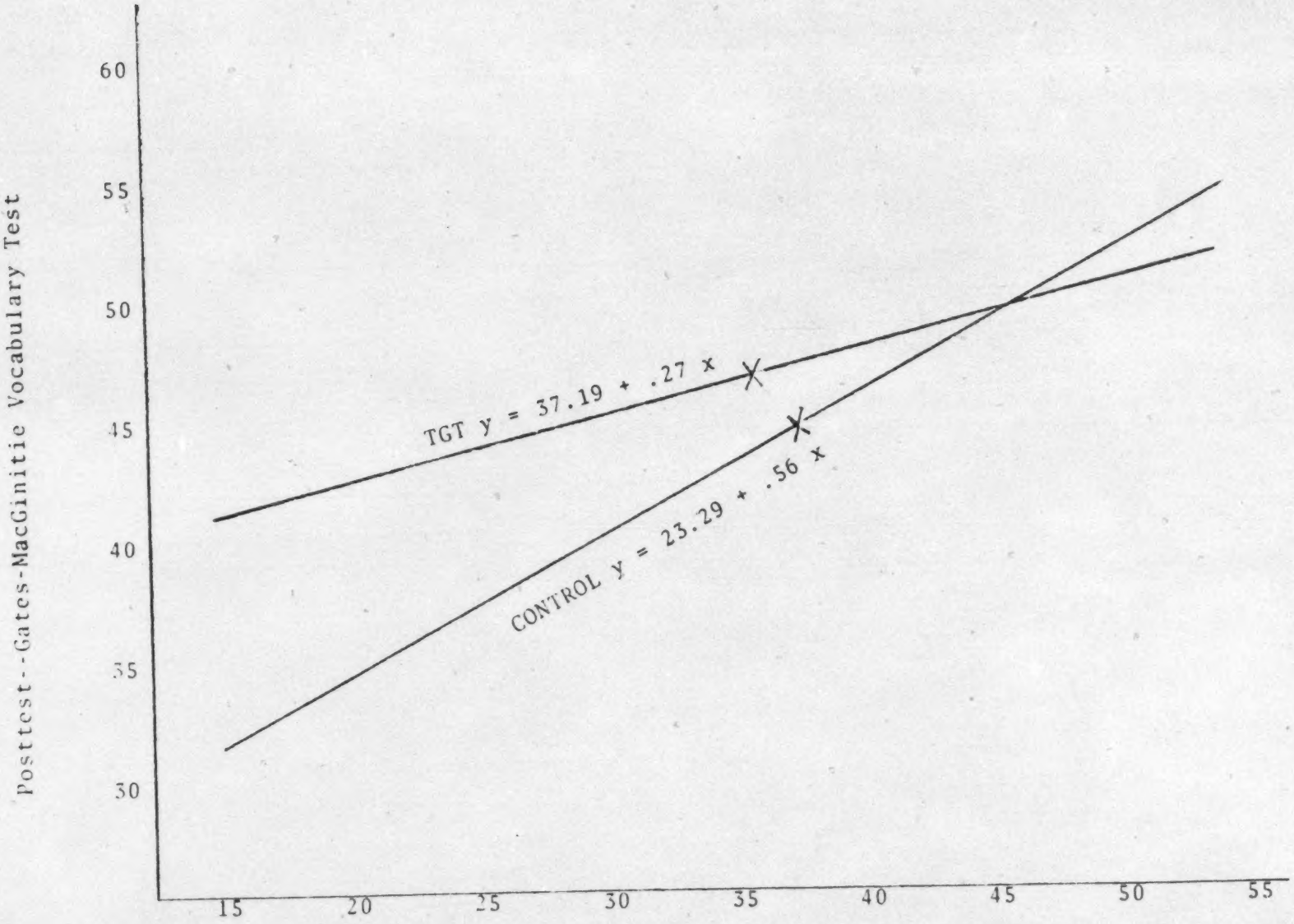

Figure 2. Within-Cell Regression Slopes for Gates-MacGinitie Vocabulary Test